Weekly Report

2018.0910-2018.0916

1. This Week

Deep Learning Power Grid Program

1.We start to train the 2,000 node dataset. We first run the model on our server but the training efficiency is low. So we transfer the model to the cluster in Wu Fan's lab and found out it will still take a month to train the model. The most time-consuming process is the data fetching process. So we tried:

- Transfer the data from json format to hdf5 to speed up the efficiency
- Compress the data before fetching and decompress it after fetching

Actually, changing the hard disk to SSD might help a lot in this process, but a large storage SSD is too expensive.

2.I talk to Huang this week. They can only provide simulation data but cannot provide real datasets (they don't have). So I plan to look for real power grid datasets online the next week.

3.I start to arrange the references and compose the structure of this paper (what we are still missing and what is our contribution). There are more details needed to be added.

4.Chen Zexian is applying tucker and CP tensor decomposition to this dataset to find if it works to detect salient patterns.

Wavelines Revision

1.Revise the structure of the paper:

- Introduce the data in section 1
- Remove section 3 to appendix
- Revise the narration of section 5. Describe the representation in section 5.1

Others

1.Help revise the CHI paper of Mei.

2.Prepare for the group meeting representation on 9.17.

3.Go to the hospital for my waist on Thursday. It has been hurting for a week.

Working Hour: (except nap and eat time)

8-9 hours / week day (6 hours on Thursday)

4 hours / weekend day

Total Working hour this week: 49 hours

Paper Reading

1.Clustrophile 2: Guided Visual Clustering Analysis (VAST 2018)

This paper is an extended work of Clustrophile, which is first published on SIGKDD. Different from the former one, this work adds more visualization functions and provides a detailed process for comparing different clustering methods and clustering results. In this paper, the

system/tool includes abundant functions and interactions, but the entire design is still in good order and can be easily understood. This may partly thanks to the narration of the paper but more importantly, the system design is worth learning from for its ordered design arrangements.

2. Structure-aware Fisheye Views for Efficient Large Graph Exploration (VAST2018)

This paper presents a novel fisheye technique which can preserve the context structure when enlarging the focused area. It is solved by using an optimization function which contains three terms corresponding to the constraints of structure, readability, and temporal coherence respectively. This method can be applied to the power grid topology exploration when the grid is large. However, the efficiency problem needs to be solved when applying to a thousand node grid.

3. Constructing Convex Inner Approximations of Steady-State Security Regions (IEEE Power System 2018)

This paper presents a framework to compute a safety area in a given paired variable (le (voltage-) range (a possible range that the power flow may be constrained in). It constructs inner approximations of the steady-state security sets and verifies its method by rigorous formula deduction. The advantage of this method is that it does not rely on any special modeling assumptions and is applicable for general transmission system power flow problems. This method can be used to define a safety security range when we need to analyze the operation of a power grid.

4. Urban MV and LV Distribution Grid Topology Estimation via Group Lasso (IEEE Power System 2018)

This paper proposes a probabilistic graphical model to examine the bus connectivity and estimate the grid topology. It works with only voltage data and can estimate not only radial systems but also mesh networks. The average estimate accuracy over 21 network configurations (including real data from PG&E and NREL) is over 95%. Since the topology data we get from the simulation data is not complete (lack most links) and the complete topology dataset is stored in the picture format and cannot be given to us, this method can be extremely useful to estimate the connection between buses,

5. Sliding-Window-Based Real-Time Model Order Reduction for Stability Prediction in Smart Grid (IEEE Power System 2018)

This paper proposes a real-time order reduction technique for stability prediction in the smart grid. It uses an online orthogonal decomposition algorithm. A snapshot matrix on a sliding sampling window is used for extracting the main components of the system states by performing a randomized singular value decomposition. After reducing the order of the system, a local linear model is estimated for this snapshot matrix. Then, the state of the system is predicted in a sliding prediction window. Finally, a suitable stability index is calculated and the stability of the system is forecasted in this prediction window. The proposed method is capable of predicting the transient stability, unstable and the stability limit. And it can be used for first swing and multi-swing instability detection.

2. Progress

Task	Progress	Time
Wavelines Revision	1.Revise the data description in introduction	In 2 weeks
Power Grid Paper with Deep Learning	1. Train the 2,000 node data (100,000 samples) 2. Prepare to write the paper	12.15
SQC paper	Delayed	-